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Comparative assessment between Clinical and CT scan diagnosis in the treatment of blunt abdominal trauma

Comparison between Clinical and CT scan diagnosis of blunt abdominal trauma

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Abstract

Aim: In this study, we aimed to determine the validity of CT scan as an accurate diagnostic tool in the management of patients with blunt abdominal trauma.
Material and Methods: This prospective cross-sectional descriptive study was conducted at the Department of Surgery, Northern Medical Tower, in Arar Kingdom of Saudi Arabia for 2 years from January 2018 to December 2019. Inclusion criteria were patients who admitted to the emergency room with blunt abdominal trauma due to motor car accident (MCA), h/o fall, assault, etc. and they were hemodynamically stable and underwent computed tomography (CT) scan of the abdomen. Exclusion criteria were hemodynamically unstable patients with obvious peritoneal signs and penetrating abdominal trauma. The CT findings were compared and correlated with the operative findings. The variables of the study are demographic data, mechanism of trauma, management (conservative or surgical), and clinical outcomes.
Results: This study included 340 patients with blunt abdominal trauma, 306 (90 %) males and 34 (10 %) females with a ratio of M 9:1 F. The age of the patients ranged from 12 to 65 years with the mean age of 36.15 ± 1.5 years. Road traffic accident (75%) was the most common mechanism of injury. Spleen (49%) was the commonest organ injured and the second common organ was liver (19%). Of the total 340 patients, 132 patients had clinical presentation of solid intra-abdominal organ damage (39%) and in 208(61%) patients there was no intra-abdominal organ damage. Thus, 313 (92 %) patients were conservatively managed and 27 (8%) patients underwent surgery. There were 4 (1%) deaths.
Discussion: CT scan is an accurate diagnostic tool in the evaluation and management of blunt abdominal trauma patients. Negative CT scan findings avoid unnecessary emergency abdominal exploration.

Keywords
Abdominal trauma; Computed tomography; Hemoperitoneum; Organ injuries

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Introduction

Trauma is still causing a significant number of emergency visits globally. Abdominal trauma contributes significantly to the morbidity and mortality of trauma patients [1]. Evaluating patients who have sustained blunt abdominal trauma (BAT) remains one of the most challenging and resource-intensive aspects of acute trauma care. Missed intra-abdominal injuries continue to cause preventable deaths [2]. In developed countries, trauma victims have better outcomes because of the costly trauma care centers with multidisciplinary teams caring for the victims. The implementation of policies to prevent or reduce the occurrence of trauma has recently come into play [3].

Blunt abdominal trauma usually results from motor vehicle collisions, assaults, recreational accidents, or falls [4]. Men tend to be affected slightly more often than women and mostly younger age groups. The most commonly injured organs are spleen, liver, small bowel, kidneys, but bladder, colorectal, diaphragm, and pancreatic injuries are rare. The CT scan remains the criterion standard for the detection of solid organ injuries. In addition, a CT scan of the abdomen can reveal other associated injuries, notably vertebral fractures, pelvic fractures and injuries in the thoracic cavity. The rate of negative laparotomy is reduced by avoiding surgical intervention in cases that can be managed conservatively. CT scan is highly sensitive in the diagnosis of blunt abdominal trauma in stable patients but not recommended in patients with a clear indication of laparotomy and hemodynamically unstable patients [5]. The objective of this study was to assess the efficacy of CT scans as an accurate diagnostic tool in patients with blunt abdominal trauma.

Material and Methods

This prospective cross-sectional descriptive study was conducted with 340 patients admitted to the ER department with blunt abdominal trauma due to motor car accident (RTA), h/o fall or assault admits in Northern Medical Tower, during the period of 2 years from January 2018 to December 2019. Ethical clearance was obtained from the Institutional Research Committee of Bio-Ethics prior to the study and informed consent was taken from the patients. All hemodynamically stable patients with blunt abdominal trauma were included in this study. Exclusion criteria in this study were hemodynamically unstable patients, patients with obvious peritoneal signs, and penetrating abdominal trauma and also those in which CT scan protocol was not followed. Patients were resuscitated and preliminary FAST ultrasound was performed in ER when patients become vitally stable followed by CT scan of the abdomen. Patients who had at least one of these scans interpreted as positive were included in the study. All stable patients with BAT were thoroughly assessed by history and clinical examination. The demographic data, mechanism of trauma, organ injury, and clinical outcomes were recorded in a questionnaire. CT scans were obtained with a Hi Speed Dual Helical CT scanner from General Electric. A single breath-hold helical scan from the top of the T12 vertebral body to the pubic symphysis was obtained by using 5-mm beam collimation and 8 mm/sec table speed (pitch, 1.6; 120 kVp; 240–270 mAs). Routine oral (or through nasogastric tube) contrast agents in the form of 1-2% diluted ionic iodinated contrast were given 30-40 minutes before the study. Contrast-enhanced CT was performed with 50 ml of an intravenous bolus of iodinated contrast agents. Delayed CT scans were also incorporated whenever there was suspicion of kidney or urinary tract injury. Oral contrast was avoided in patients with blunt abdominal trauma who were potential candidates for emergency surgery and need general anesthesia. Percentages and types of trauma identified were based on CT scan findings. Following the completion of the examination, the CT images were immediately reviewed by specialist radiologists. The CT findings were compared and correlated with the operative findings, or clinical follow-up in patients managed conservatively. The Variables of the study were demographic data, mechanism of trauma, management (conservative or surgical), and outcome. Individual organ injuries were graded according to the OIS (Organ Injury Scale) guidelines. Data were entered into Microsoft Excel and statistical analysis done using SPSS-16.

Results

Three hundred forty patients with blunt abdomen trauma were prospectively studied, 306 (90) were male and 34 (10%) female. Their ages ranged from 10 to 65 years (the mean age of patients was 36.15 ± 1.5 years). Road traffic accident was the commonest mode of injury-causing abdominal trauma in 255 patients (75%). In 51 patients (15 %), the injury was caused due to falling from height, and 34 patients (10%) had blunt injuries from other miscellaneous causes as shown in Table 1. During CT scan of patients with blunt abdominal trauma, hemoperitoneum was detected in137 (40%) patients. There were 110 patients with a small amount, 15 patients with a moderate amount and 12 patients with large hemoperitonum. All patients with small and 12 patients with moderate hemoperitoneum managed conservatively while 12 patients with large and 3 patients with moderate haemoperitoneum required surgical exploration. Among patients who had intraabdominal organ damage, in 67 (49%) patients, spleen was the commonest solid organ involved, followed up by liver in 26 (19 %) patients, kidney in 21 (15%), and pancreatic injury in 5 (4%). Six (4%) patients had mesenteric tear, 6 patients had (4%) bowel injury and 4 (3%) retroperitoneal hematoma as shown in Table 2. In this study, injuries commonly associated with blunt abdomen trauma detected with CT scan were chest injuries including rib fractures, pneumo/hemothorax, lung contusion besides fracture of pelvis and spine.

Of the total of 340 patients, 132 patients had clinical presentation of solid intra-abdominal organ damage (39%) and in 208(61%) patients there was no intra-abdominal organ damage. Patients with solid organ injury were graded by CT-OIS grading, mostly 106 patients (89%) had grade I–III injuries, only13patients (11%) had grade IV or higher injuries. All OIS grade IV, V, and 2 grade III patients underwent surgery others were managed conservatively. Among the 67 splenic injuries, 50 had mild injuries (grade I and II) (Figure 1), 17 had grade III, IV, and V injuries (Figure 2). Nine of the 17 patients with moderate to severe (grade III, IV, and V) injuries required surgery. Twenty-six patients had liver injuries. Twenty-two had grade II and III and were managed conservatively (Figure 3), while 4 patients had grade IV - V injuries and required surgery. Twenty-one

patients had kidney injuries and all of them were unilateral. Nineteen patients had grade II–III injuries and were managed conservatively, while 2 patients had grade IV- V injuries and underwent surgery. Patients with pancreatic injuries had grade II–III injuries which were managed conservatively. CT-Organ Injury Scale (OIS) and management of the patients with solid organ injuries showed in Table 3.

In our study, 132 patients had clinical presentation of solid intra-abdominal organ damage (39%) but on CT scan findings, in 4 cases, there was no intra-abdominal injury (FN) while in 208 cases clinically, there were no intra-abdominal injuries while in 5 cases (FP) there were positive CT scan findings. This study shows that CT scan in blunt abdominal trauma has the sensitivity of 97%, specificity of 97%, positive predictive value of 98.% and negative predictive value of 96 % while overall diagnostic accuracy was 97.3%. In this study, in out of 340 patients with blunt abdominal trauma, only 27 patients underwent surgery while 313 patients were conservatively managed without any complications .There were four deaths , one of which was related to postoperative complications. The other patients died of associated head injuries.

Table 1. Frequency of mechanism of trauma in Blunt abdominal trauma (n=340)

Cause	Number of cases	Percentage
MCA – (RTA)	255	75%
Fall from height	50	15%
Pedestrian accident	14	4%
Assaults / Fighting	14	4%
Sports trauma	7	2%

Table 2. Distribution of individual organ injury in blunt abdominal trauma (n= 132)

Organ injured	Number of cases	Percentage
Spleen	67	49%
Liver	26	19%
Kidney	21	15%
Pancreas	5	4%
Small intestines	6	4%
Mesenteric tear	6	4 %
Retroperitoneal hematoma	4	3%

Table 3. Distribution of solid organ injuries according to the CT-Organ injury scale (OIS) grading and their management (n=119)

OIS –grade	Total number of patients	No. of conservatively managed patients	No. of operated patients
I	52	52	0
II	37	37	0
III	17	10	2
IV	8	0	8
V	5	0	5

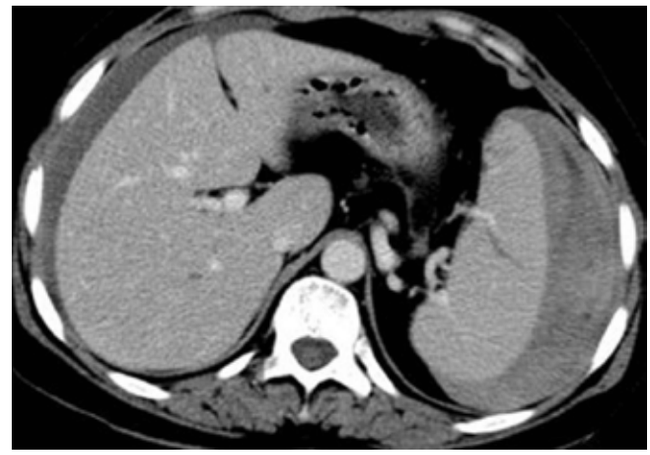

Figure 1. Spleenic tear with sub capsular hematoma (Grade I injury)

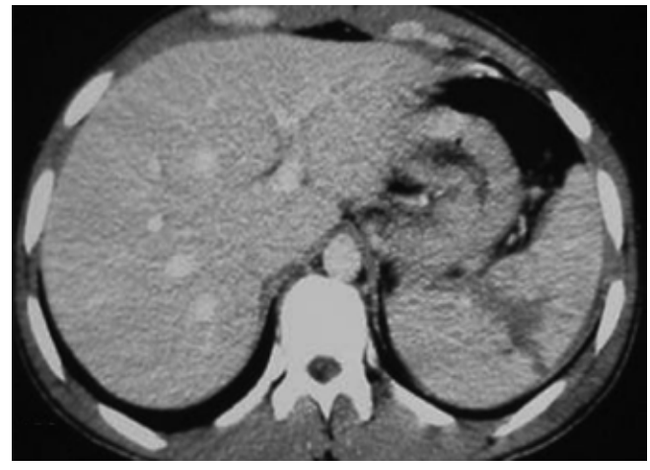

Figure 2. Deep laceration in spleen (Grade III injury)

Figure 3. Laceration in the right lobe of liver (Grade II injury)

Discussion

Trauma is the third cause of death in all ages and is the first cause of death in the population aged 5 to 25 years and imposes billions of dollars annually in healthcare systems [6,7]. In countries where there has been an increase in the number of vehicle use and industrial development, trauma, especially abdominal trauma, has increased. Most patients with blunt abdominal trauma are in the third decade of their life. [8]. The

most common mechanism of blunt abdominal trauma is a car crash. Falling from height, a direct hit to the abdomen, fight, football, and crushing are other causes of blunt abdominal trauma [9]. Particularly, among multiple trauma patients, abdomen is the third most frequently injured body part [10]. FAST - Ultrasound is an early diagnostic method to detect free fluid in the abdomen and pelvic cavity [11-13]. Emergency physicians may request a CT scan, DPL, laparotomy depends on the patient's condition and the damage pattern [14].The most important step in trauma patients is ABC (airway, breathing, circulation according to Advanced Trauma Life Support (ATLS) guideline). The pre-hospital care of trauma patients is important in trauma patient care, and it determines the outcomes after injury [15]. Early management of patients is an important factor in determining prognosis. Closed monitoring and repeating the clinical examination and reassessment are mainstays decision making for surgical intervention or nonsurgical treatment. This study includes 340 patients with blunt abdomen trauma out of them, 306 (90%) were male and 34 (10%) were female. Their ages ranged from 10 to 65 years (the mean age of patients was 36.15 ± 1.5 years). Similar findings were reported by other studies by Babak Abri [16] et al. and Om Bahadur K [17] in which among the 332 patients, 212 (63.9%) were male and 120 (36.1%) were female, most frequent age range was 20-40 years (the mean age of patients was 34.15 ± 1.6 years). The most common mechanism of blunt abdominal trauma evaluated in most studies was motor car accidents (MCA, RTA) [18,19].

The present study also showed that road traffic accident (RTA) was the commonest mode of injury-causing blunt abdominal trauma in 255 patients (75%), fall from height in 51 patients (15%), and other miscellaneous causes in 34 patients (10%), similar findings were reported by other study of Gezen FC et al [20].

Of the total 340 patients in our study, 119 patients had solid organ injuries, spleen 67 (49%) was the commonest solid organ involved, followed up by liver 26 (19 %), kidney 21 (15%) and pancreatic injury 5 (4%). CT organ injury scale (OIS) grading in these patients showed that all 89 patients with grade I-II injuries were conservatively managed, while 13 patients with grade IV-V injuries were operated. However, the majority of grade III injuries were either managed conservatively or operated depending on their assessment on an individual basis. The result was compared with a study by Mazen IH et al. [21] which showed the solid organ injuries as follows: 95 (38.8%) splenic, 63 (25.7%) renal, 48 (19.6%) hepatic and 13 (5.3%) pancreatic injuries. Although, hollow viscous injuries after blunt trauma are rare, it remains the third most common injury in blunt abdominal trauma and had a reported incidence of 1-2% of all blunt trauma cases [22]. In our study, the hollow viscous (Bowel) injury was in 6 patients (4.5%).

In the present study, among 340 patients with blunt abdominal trauma, 313 cases (92.0%) were treated with conservative management while 27 patients (8%) were treated surgically. In another study [14], among 332 patients with blunt abdominal trauma, 300 cases (90.4%) were treated with nonsurgical procedures and 32 patients (9.6%) were treated surgically. The increasing use of nonsurgical methods may be due to higher access to imaging methods in the emergency department. In the present study, among 340 patients, 4 patients (1%) died, 306 patients (90%) were cured completely and 30 patients (9%) suffered morbidity.

We conclude that CT scan is the superior diagnostic modality in the diagnosis of abdominal trauma. CT must also be performed in symptomatic patients with negative US scans and in patients with suboptimal US scans. Hence correct management of blunt abdominal trauma should be based on clinical examination, hemodynamic stability of patients in conjunction with radiological investigations.

Limitations of this study were patients with penetrating abdominal trauma and those in which CT scan protocol was not followed.

Conclusion

CT scan abdomen is an accurate diagnostic tool, and an initial investigation of choice in hemodynamically stable patients with blunt abdomen trauma. Negative findings of abdomen CT scans decrease unnecessary exploratory laparotomies by avoiding surgical intervention in cases that can be managed conservatively.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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References

1. Arumugam S, Al-Hassani A, El-Menyar A, Abdelrahman H, Parchani A, Peralta R, et al. Frequency, causes and pattern of abdominal trauma: a 4-year descriptive analysis. J Emerg Trauma Shock. 2015;8(4):193.

2. Hamidi MI, Aldaoud KM, Qtaish I. The Role of Computed Tomography in Blunt Abdominal Trauma. Sultan Qaboos Univ Med J. 2007;7(1): 41–6.

3. Hardcastle TC, Oosthuizen G, Clarke D, Lutge E. Trauma, a preventable burden of disease in South Africa: review of the evidence, with a focus on KwaZulu-Natal. S Afr Health Rev. 2016;2016(1):179–89.

4. Vadodariya KD, Hathila VP, Doshi SM. The role of Computed Tomography in blunt abdominal trauma as investigative tool conducted at tertiary level hospital, Vadodara. Int J Med Sci Public Health. 2014;3:433-5.

5. Magray M, Shahdhar M, Wani M, Shafi M, Sheikh J, Wani H. Studying The Role Of Computed Tomography in Selective Management of Blunt Abdominal Trauma Patients in a Single Tertiary Care Centre in Northern India. The Internet Journal of Surgery. 2013;30(2):1-6.

6. Lankarani KB, Heydari ST, Aghabeigi MR, Moafian G, Hoseinzadeh A, Vossoughi M. The impact of environmental factors on traffic accidents in Iran. J Inj Violence Res. 2014; 6(2): 64-71.

7. Motie MR, Behnampour N, Alinezhad H. Epidemiology of blunt abdominal trauma in Gorgan Iran (2001-05). J Gorgan Univ Med Sci. 2009; 10(4): 55-9.

8. Mnguni MN, Muckart DJ, Madiba TE. Abdominal trauma in Durban, South Africa: factors influencing outcome. Int Surg. 2012; 97(2): 161-8.

9. Hady HR, Luba M, Mysliwiec P, Trochimowicz L, Lukaszewicz J, Zurawska J, et al. Surgical management in parenchymatous organ injuries due to blunt and penetrating abdominal traumas-the authors' experience. Adv Clin Exp Med. 2012; 21(2): 193-200.

10. Abdelrahman H, Ajaj A, Atique S, El-Menyar A, Al-Thani H. Conservative management of major liver necrosis after angioembolization in a patient with blunt trauma. Case Rep Surg. 2013; 2013:954050.

11. Ala AR, Pouraghaei M, Shams Vahdati S, Taghizadieh A, Moharamzadeh P, Arjmandi H. Diagnostic Accuracy of focused assessment with sonography for trauma in the emergency department. Trauma Mon. 2016; 21(4). DOI: 10.5812/

traumamon.21122
12. Ojaghi Haghighi SH, Adimi I, Shams Vahdati S, Sarkhoshi KR. Ultrasonographic diagnosis of suspected hemopneumothorax in trauma patients. Trauma Mon. 2014; 19(4): e17498. DOI: 10.5812/traumamon.17498
13. Tajoddini S, Shams Vahdati S. Ultrasonographic diagnosis of abdominal free fluid: accuracy comparison of emergency physicians and radiologists. Eur J Trauma Emerg Surg. 2013; 39(1): 9-13. DOI: 10.1007/s00068-012-0219-5
14. Pouraghaei M, Tarzamani MK, Kakaei F, Moharamzadeh P, Shams-Vahdati S, Rostam Y. Evaluation of three phases computed tomography scan findings in blunt abdominal trauma. J Anal Res Clin Med. 2016; 4(3): 170-4. DOI: 10.15171/jarcm.2016.028
15. Hardcastle TC, Finlayson M, van Heerden M, Johnson B, Samuel C, Muckart DJ. The prehospital burden of disease due to trauma in KwaZulu-Natal: the need for Afrocentric trauma systems. World J Surg. 2013;37(7):1513–25.
16. Abri B, Shams-Vahdati S, Paknezhad S, Sepehri-Majd P, Alizadeh S. Blunt abdominal trauma and organ damage and its prognosis. Anal Res Clin Med. 2016; 4(4): 228-32. DOI: 10.15171/jarcm.2016.038
17. Karki OB. The Role of Computed Tomography in Blunt Abdominal Trauma. J Nepal Med Assoc. 2015;53(200):227-30.
18. Giannopoulos GA, Katsoulis IE, Tzanakis NE, Patsaouras PA, Digalakis MK. Non-operative management of blunt abdominal trauma. Is it safe and feasible in a district general hospital? Scand J Trauma Resusc Emerg Med. 2009; 17: 22. DOI: 10.1186/1757-7241-17-22
19. Budinger JM. A patient education tool for nonoperative management of blunt abdominal trauma. J Trauma Nurs. 2007; 14(1):19-23. DOI: 10.1097/01.JTN.0000264149.80793.98
20. Gezen FC, Cincin TG, Oncel M, Vural S, Erdemir A, Dalkilic G, et al. Noninvasive management strategy in hemodynamically unstable patients with blunt trauma. Ulus Travma Acil Cerrahi Derg. 2006; 12(1): 43-50.
21. Hamidi MI, Aldaoud KM, Qtaish I The Role of Computed Tomography in Blunt Abdominal Trauma. Sultan Qaboos Univ Med J. 2007; 7(1): 41-46.
22. Al-Hassani A, Tuma M, Mahmood I, Afifi I, Almadani A, El-Menyar A, et al. Dilemma of blunt bowel injury: What are the factors affecting early diagnosis and outcomes. Am Surg. 2013;79(9):922–7.

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